An Evaluation of Turkey's Natural Gas Hub Development Process

Araştırma Makalesi /Research Article

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ABSTRACT: *Since Turkey is a natural bridge located between the gas reserves and consumption regions, it has a big potential to create a successful natural gas hub. Although initial steps have been taken to path the way to facilitate the gas trade and create a gas hub in Turkey, there is still a long way. In this study, we derived requirements from the literature to create a working gas hub, analyzed the Turkish natural gas market's current structure in light of the derived requirements by benchmarking with developed European gas hubs, and made several policy suggestions to form a new market structure for the sake of creation of a successful gas hub. The most important result that we have obtained via this study is that Turkey is on a critical path before the expiration of long-term supply contracts and should draw a strategic path as soon as possible.*

Keywords: Energy policy, natural gas market, natural gas hub, liberalization.

JEL Codes: L95, Q41, Q48

Türkiye'nin Doğal Gaz Ticaret Merkezi Olma Sürecinin Değerlendirmesi

ÖZ: *Türkiye; doğal gaz rezervleriyle tüketim bölgeleri arasında doğal bir köprü olma özelliği sebebiyle başarılı bir doğal gaz ticaret merkezi kurulabilmek adına büyük bir potansiyele sahiptir. Bugüne kadar Türkiye'de doğal gaz ticaretinin geliştirilmesi ve doğal gaz ticaret merkezi oluşturulması konusunda çeşitli adımlar atılmış olsa da, Türkiye bu konuda hala uzun bir yola sahiptir. Bu kapsamda, "Türkiye bir doğal gaz ticaret merkezini nasıl kurar ve bir doğal gaz ticaret merkezi kurmak için gereklilikler nelerdir?" soruları gündeme gelmektedir. Bu açıdan, bu çalışmada Türkiye doğal gaz piyasasının mevcut yapısı, gelişmiş Avrupa piyasaları ile de karşılaştırılarak analiz edilmiş ve Türkiye'nin başarılı bir doğal gaz ticaret merkezi oluşturabilmesi için gerekli piyasa yapısı hususunda çeşitli politika önerileri sunulmuştur. Bu çalışmada elde edilen en önemli sonuç Türkiye'nin uzun dönemli doğal gaz alım kontratlarının sona ermesi öncesinde stratejik bir yol haritası çizmesi gerekliliği olduğudur.*

Anahtar Kelimeler: Enerji politikaları, doğal gaz piyasası, gaz ticaret merkezi, serbestleşme.

JEL Kodları: L95, Q41, Q48

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1. Introduction

Natural gas has been an accessible fuel owing to massive natural gas pipeline infrastructure improvement in the world. Since a huge capital is needed to finance such pipeline projects, long-term natural gas sale and purchase contracts have been formed to provide a guarantee for project financing. The pricing mechanism of such long-term contracts has been designed based on oil indexation called "the Groningen Model". This type of pricing mechanism was a workable solution since oil products were the main competitor of natural gas in the past (Grandi, 2010). However, after common usage of natural gas, it has started to compete with natural gas itself and such gas-on-gas competition resulted in the divergence of oil-indexed price formulas and prices formed by gas-on-gas competition. The United States, being the first country to introduce a gas-on-gas competition mechanism in the 1980s, created multiple physical natural gas hubs. Following the U.S., the United Kingdom brought a new approach to create gas-on-gas competition in the 1990s by creating a virtual trading hub, which is called National Balancing Point (NBP). UK[3]'s NBP inspired the other European countries to create a virtual gas trading hub. Meanwhile, Dutch gas hub TTF[4] has been the most liquid gas hub throughout the years (Heater, 2015). Similar to initiatives in Europe, Asian countries such as China, Japan, and South Korea have been working to create a gas hub in their countries (Xunpeng and Variam, 2018).

Turkey, as an important regional gas hub candidate in the Balkan region, has aimed at creating a virtual gas hub and started initiatives with the formation of Natural Gas Market Law (NGML) which has been in effect since 2001. Despite the steps taken so far in the way of gas market liberalization, the Turkish gas market still requires some actions to be taken to create a working gas hub. Turkey's recent gas discovery in the Black Sea Sakarya field raised again the question of whether Turkey can be a price-setting trading gas hub. There is no doubt that Turkey's recent gas discovery will contribute to Turkey's ambitions to create a gas trade hub. Moreover, today is the right time for Turkey to discuss necessary steps for a successful setup of a gas hub since Turkey's long-term gas supply contracts will expire between 2021 and 2026, and Turkey's natural gas production is estimated to start by 2023.

For the sake of forming a working gas hub in Turkey, the core requirements should be reviewed and other gas hub structures should be analyzed with their pros and cons to shape the Turkish gas market structure in an ideal framework. For this reason, in this study, we investigated the requirements to create a working virtual gas hub based on the European countries' experiences. Following that, we discussed the Turkish gas market's current situation regarding the gas hub development process considering requirements to create a gas hub derived from

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[3] United Kingdom
[4] Title Transfer Facility

the literature. In light of this analysis, we made several policy recommendations for Turkey to realize a smooth transition to a virtual gas hub and mitigate risks in the transition period.

Turkish gas market liberalization process has been addressed by the literature since liberalization attempts started in 2001. However, our study takes a step forward and contributes to the literature by addressing Turkish gas hub development by benchmarking with successful hub development examples. Moreover, recommendations to mitigate risks in the transition period to a virtual hub system ensure the novelty of this study.

In this regard, in the second section of this study, we give a brief overview of the relevant literature. In the third section, the requirement to create a successful gas hub is summarized and the Turkish gas market's current structure is discussed in the context of requirements to create a successful gas hub. Following the analysis of the Turkish gas market, policy recommendations have been made for Turkey to create a working gas hub and mitigate the risks in the transition period. In the last section, a brief overview of derived conclusions has been presented.

2. Literature

To have an insight into the Turkish gas market structure, we investigated past studies addressing the Turkish gas market from the literature. Akcollu's (2006) study is one of the earliest studies on this topic which addresses major challenges to the Turkish gas market liberalization. Cetin and Oguz (2007) presented the Turkish natural gas market structure and addressed the main barriers for Turkey to liberalize the gas market. Erdogdu (2007) evaluated the regulatory framework created by NGML and made policy suggestions. Umucu et al. (2012) discussed Turkey's chance to become a transit gas hub considering potential sources and natural gas pipeline projects. Taglipierta (2014) studied Turkey's gas hub potential in terms of gas supply sources around Turkey. Austvik and Rzayeva (2017) conducted a study focusing on the gas market structure and geopolitical position of Turkey in terms of creating a hub goal. Hasanov (2018) studied the Turkish gas market's import liberalization by applying a game-theoretic model and made suggestions based on the model results. Biresselioglu et al. (2019) applied a SWOT analysis to reflect the private sector perspective on Turkish gas market liberalization and made policy recommendations based on the consensus reached by Turkish natural gas industry representatives.

In addition to the studies on the Turkish gas market, we made a research on the studies focusing on gas hub development. Xianguang et al. (2014) analyzed China's current situation in terms of gas hub development. The authors made a SWOT analysis and derived a strategic path for China to establish a gas hub. Miriello and Polo (2015) studied the development of wholesale markets for a different level of market liberalization. They analyzed the UK, Netherland, Germany, and Italy gas hubs with regard to development stage requirements.

Xunpeng (2016) concentrated on European gas hub development and took lessons for East Asia to create a functioning hub. The author carried out a comparative study between Europe and East Asia and analyzed East Asian Countries' hub development. Xunpeng and Variam (2018) created a framework determining key elements for a functioning hub. Besides, they applied the framework for the East Asian countries such as Japan, China, and Singapore. The framework created by Xunpeng and Variam (2018) formed a basis for the framework we created in this study.

3. Turkish Gas Market's Evaluation

In this section, we analyzed the current structure of the Turkish gas market from different aspects in the context of gas hub development experiences presented in the literature. We created a framework by deriving the requirements of a gas market to create a working gas hub that has been addressed by academic papers and sectoral reports. These requirements given below are addressed in detail in the remaining part of this section considering the Turkish gas market structure.

- Market liberalization
- Entry-exit system
- An exchange and standard contracts
- Market-based balancing
- Adequate infrastructure and access to natural gas resources
- Transparency and price reporting agencies
- Financial products and financial institutions

3.1. Market Liberalization

There is no doubt that market liberalization is the number one requirement for a well-working gas hub. However, obstacles to market liberalization have been the most problematic barriers to the establishment of a gas hub for developing gas markets. One of the most crucial obstacles for a liberalized gas market is the vertical integration of wholesale, transmission, and storage activities. To remove this obstacle, European countries unbundled their monopoly companies to multiple entities focusing on a specific activity as the first step of gas market liberalization. Turkey is still far away from this target since state-owned company BOTAS still conducts transmission, storage, LNG, wholesale and retail activities in the Turkish gas market. Wholesale and retail activities, as well, should be unbundled to reach competition and liberalization targets in the gas sector. To ensure the unbundling of wholesale and retail activities, long-term contracts between wholesale and retail companies might be banned for a period to exhilarate gas trade on the wholesale market (Polo and Scarpa, 2012). In the Turkish gas market, retail and wholesale activities are vertically integrated and therefore need to be unbundled to reach a liberalized market.

Third-party access to gas infrastructures is an essential requirement to ensure liberalization in a gas market. European countries started to develop and harmonize third-party access rules right after Directive 2009/73/EC issued by the European Commission (EU, 2014). Meanwhile, ENTSOG developed network codes to create a common understanding of non-discriminatory access rules to infrastructures such as CAM[5] and BAL[6] network codes. In this regard, Turkey firstly initiated the necessary steps with the development of third-party access rules in the transmission system activities by issuing the BOTAS network code of the gas transmission system in 2004. This network code has been followed by underground storage and LNG terminal network codes which set the rules for non-discriminatory access to these facilities.

The degree of competition, which is another crucial indicator for market liberalization, depends on the market share of players in a gas market. North-west European gas hubs NBP and TTF are the only examples not having a dominant participant in the gas market. On the other hand, some other gas hubs in Europe could not have created a perfect competition structure as north-west European hubs have done (Heater, 2015). For instance, although Italy's ENI has a dominant role in PSV[7], Italy insists on having this 'National Champion' company and not relinquishing it (Xunpeng, 2016). Turkish gas market is, as well, far away from a competitive structure. Following Natural Gas Market Law enacted in 2001, new players entered the market and the monopolistic structure of the market shifted to an oligopolistic structure. Although, approximately 40 players participate in the Turkish gas market currently, BOTAS's share of the imported gas in Turkey is still approximately 80 percent (Austvik and Rzayeva, 2017).

Another important point that has an impact on liberalization is the need for gas infrastructure investments (Cetin and Oguz, 2007). If infrastructures in a natural gas market are sufficient and utilization from the infrastructures is not costly, then liberalization might be fastened (IEA, 2013). Therefore, gas infrastructures can be regarded as essential elements before driving competition in a gas market (IEA, 2013). To make capital-intensive infrastructure investments, a strong monopolistic company is required which has been BOTAS in the Turkish case. Since BOTAS played this role, the liberalization target which has been set in 2001 with NGML was not realistic since the infrastructures of the Turkish gas market were not sufficient at that time. However, Turkey's gas infrastructure developments, mentioned in the remaining part of this paper, carried out in recent years have paved the way for the gas market liberalization process.

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[5] Capacity Allocation Mechanism
[6] Balancing
[7] Punto di Scambio Virtuale

3.2. Entry-Exit System

An entry-exit system can be defined as a small part of a grid or a whole network located in a country or countries in which natural gas can be traded via buying capacities on the entry and exit points (Miriello and Polo, 2015). Since the entry-exit system is one of the essential elements to create a virtual hub (Miriello and Polo, 2015), European countries created entry-exit systems in the process of gas hub development. An entry-exit system is practical for shippers since it does not include gas transmission distance into tariff calculations and as a result, does not occupy shippers with any detail rather than entry and exit capacities.

Turkey has a domestic virtual trading point called UDN[8] (Rzayeva, 2014). The transactions held at this point are delivered in the Turkish gas grid which can be considered as an entry-exit system. Shippers can conduct their transactions only by taking entry and exit capacities from the Turkish gas network operator BOTAS.

A transmission grid should not have congestion to be called an entry-exit system. In case of having congestion in a transmission system, two entry-exit systems and two different hubs can be created. To reach this target, Turkey's gas grid has been improved to be sufficient for becoming one entry-exit system without having any congestion (Rzayeva, 2018).

3.3. An Exchange and Standard Contracts

Since trade transactions in gas hubs can be carried out bilaterally, on over the counter (OTC) platforms, or on gas exchanges, the establishment of gas exchange is a crucial step to create a competitive natural gas market by means of creating a price signal, standardizing contracts, and publishing all information to relevant parties (IEA, 2013).

Another key point to create a successful gas hub is having standard contracts (Heater, 2015). An exchange provides standard contracts such as day-ahead and intra-day products. However, standard OTC contracts are needed to be used in a successful hub. Brokers may offer OTC contracts as well as EFET[9] contracts may be used in a gas market.

Turkey took a big step by launching the gas-trading platform on 01/09/2018. An independent exchange operator named Energy Exchange Istanbul (EXIST) operates this exchange. The exchange has a continuous trading mechanism starting from day-ahead 08:00 am and finishing day-after 02:00 pm. Since products in the exchange require physical delivery, only players having a wholesale license and signing standard transmission contract with TSO are allowed to sign up for the exchange (EMRA, 2018).

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[8] Ulusal Dengeleme Noktası
[9] European Federation of Energy Traders

3.4. Market-Based Balancing

In developing gas hubs, balancing has been a primer objective of market players. Since it is an inherent requirement, balancing rules in a competitive natural gas market should be set clearly. To create a comprehensive and harmonized balancing code for European countries, ENTSOG issued a balancing code that sets basic rules of balancing in the European Union area. These rules suggest that a market-based daily balancing regime should be applied in European Countries (EU, 2014).

European hubs reached a higher level when market-based balancing has been started to be used. For example, although the Netherlands created the TTF in 2004, liquidity in TTF showed a dramatic increase when market-based balancing rules were applied (Miriello and Polo, 2015). NBP also owes its success to market-based balancing rules. Indeed, the UK's balancing rules have been a basis for the EU balancing regime (EU, 2014).

Turkey has recently developed a market-based balancing mechanism with the introduction of the new exchange. The rules of the balancing mechanism are aligned with ENTSOG Balancing Code (EU, 2014). According to the Turkish gas balancing mechanism, Transmission System Operator BOTAS buys or sells gas on the exchange to balance gas transmission linefill, facilitating the trade on the exchange and helping the liquidity to grow (EMRA, 2019). Moreover, shippers are expected to balance themselves daily in the balancing system. They have the opportunity to balance their portfolio by participating in the exchange or conducting bilateral transactions. In case, a shipper is imbalanced at the end of the day, the transmission system operator charges an imbalance fee to shippers calculated by daily gas reference price and transmission system operator's cost of balancing gas grid for the imbalanced day (EMRA, 2019).

3.5. Adequate Infrastructure and Access to Natural Gas Resources

A hub price could be accepted by the market only if the hub is interconnected to supply and demand regions. For this reason, supply and demand are the most important drivers of pricing in a liquid gas hub (Hulshof et al., 2016). Since supply is a natural requirement for a hub, distance to production locations is inevitably important as well. NBP can be given as a successful gas hub example having a strategic location that is close to production regions. The United Kingdom can provide approximately half of the demand from production in a year (Blaket et al, 2018). TTF as well can be supported by Dutch production and this enhances liquidity in the Dutch gas market.

Infrastructures such as transmission pipelines, LNG, and storage facilities are of great importance as well for a working gas hub (Rzayeva, 2014). Storage capacity is a crucial factor affecting a hub's success by means of compensating supply-demand swings and preventing the hub from price shocks (Xunpeng and Variam, 2018). Meanwhile, European countries have developed their interconnected

transmission capacities which helped them to create interconnected gas hubs. Despite their developed natural gas grid, European countries are still keen on developing new pipeline projects (Bianco et al., 2015).

Turkey is currently a gas importing country and 99 percent dependent on imports to satisfy natural gas demand in the country. However, the discovery of the new Sakarya gas field will prospectively be a game-changer in terms of Turkey's gas supply strategies. This discovery will help Turkey to increase liquidity and strengthen the price signal in the gas market. In case Turkey's gas reserves increase in the following years, Turkey might change its role from importer to an exporter as the United States did in the last decade. While pipeline import of Turkey is provided by neighboring countries, the LNG import option as well is available through four LNG regasification facilities. Turkey imports gas from Russia, Iran, Azerbaijan, and LNG from Algeria, Nigeria, and some other countries. Gas-consuming regions are located mostly in the western part of Turkey. Therefore, the transmission system operator needs to transmit gas coming from the sources located in the east such as Iran and Azerbaijan. Bottlenecks that had been faced in the past have been solved by BOTAS by strengthening gas transmission infrastructure (Rzayeva, 2018).

Turkey has five pipeline-gas entry points, four LNG import facilities, two of which are FSRU, two underground storage facilities, and one export point to Greece (Figure 1). Turkey's gas transmission infrastructure has been improved in recent years. Turkey developed compressor stations, build new pipelines, expanded the capacity of LNG and underground storage facilities, and build new LNG facilities. Moreover, two transit pipeline projects (TANAP and TurkStream) contribute to Turkey's gas market by increasing supply options. As a result, supply exceeded demand even in the peak days in Turkey which was not the case in the previous years (Rzayeva, 2018). Before these developments, any efforts to create a gas trading hub in Turkey were idle. However, these infrastructure developments established a basis for the other developments to satisfy requirements for creating a gas hub in Turkey.

Figure 1: Turkey's Natural Gas Transmission System Map (BOTAS, 2020)

Turkey is located as a bridge between the production regions in the east, north, and south of the country and consumption regions in Europe (Austvik and Rzayeva, 2018). Moreover, Since Turkey is one of the biggest gas consumers in Europe; it is advantageous in terms of having a stable demand in the gas market. There might be additional gas resources either to supply the Turkey gas market or to cross Turkey and supply gas to European Countries. The Middle East and East Mediterranean resources are important candidates to feed the Turkish gas grid and help Turkey to create a liquid gas hub.

To sum up, Turkey has been one of the biggest candidates to create a gas hub in the Mediterranean region and strengthen its position by the discovery of a new gas field in the Black Sea and developing infrastructure capacities. However, Turkey should continue to develop its gas infrastructure. Furthermore, the region, in which Turkey is located, has many advantages due to having a location in the middle of Russia, Azerbaijan, the Mediterranean Sea, and consumption regions.

3.6. Transparency and Price Reporting Agencies

Transparency is an inevitable requirement to ensure reliability, attract investors, and enhance liquidity in a market. Meanwhile, price transparency is the most crucial part of providing the required signals to the market. Exchanges are the main drivers for price transparency in a hub in terms of publishing reference price. Although exchanges form an important part of a transparent market, OTC prices might have more importance than an exchange in terms of transparency since OTC volumes might be higher than exchange volumes. Therefore, Price

Reporting Agencies (PRAs) are required in a market to publish prices created out of exchanges (Xunpeng and Variam, 2018).

Successful European gas hubs provide sufficient information to market players. Developing hubs need to satisfy this basic requirement by improving data collection and publishing this data to market (Miriello and Polo, 2015). UK's NBP is an example that real-time trade information is available on the ICE and broker screens. Moreover, historic data can be reached by agencies such as ICIS, Argus, Heren, and Platts (Heater, 2010).

Transparency of gas trade in Turkey has been improved by the establishment of the gas exchange. Following the establishment of the gas exchange, a transparency platform has been established by EXIST, and daily reference price, trade volumes, and transmission system linefill data have been published in the EXIST transparency platform since 2018 (EXIST, 2019).

On the other hand, OTC trade prices are not recorded since neither there is a central OTC platform nor PRAs operate in the Turkish gas market. Therefore, there is no clue about the prices of transactions carried out of the exchange. This point might need development in the future to enhance transparency and predictability.

3.7. Financial Products and Financial Institutions

A hub can be considered as a reference point only if it can provide financial products to the players in the gas market. Since financial products constitute the great majority of liquidity in a developed gas market, benchmark gas prices are fundamentally affected by financial products' prices. Furthermore, financial instruments are the bodies that demonstrate a hub's level of development. Although a hub is firstly used for balancing purposes, when the liquidity raises to sufficient levels, the hub can be considered as a second source of gas procurement. At a mature hub, financial products can be used as a risk management tool to mitigate price risks in a liquid gas market (Miriello and Polo, 2015).

On the other hand, financial bodies such as banks and hedge funds are of great importance in developing a hub's liquidity to higher levels. Financial market participants increase liquidity by offering products with future delivery. Moreover, financial institutions mitigate the financial risks of the participants who have the physical delivery obligation, by offering financial tools and increasing confidence in the market (Rzayeva, 2014). Since financial parties can sometimes participate in the spot market to balance their position, financial and physical markets can be considered as completely integrated markets so that the financial market can be regarded as an essential requirement for a developed hub (Xunpeng and Variam, 2018).

Turkish gas market offers only spot products that bring physical delivery obligations to shippers (EMRA, 2018). However, future products are currently developed by EXIST and are expected to come online at the end of 2021. Furthermore, financial institutions might participate in the Turkish gas market right after the introduction of financial products in the exchange.

4. Policy Suggestions for Turkey's Natural Gas Hub Development

In this section, we give policy suggestions for Turkey in light of the evaluations made in the previous section. Our policy suggestions are divided into two categories: short-term and mid-term. While short-term refers to the period until the end of 2021, mid-term refers to the period between 2021-2026. Our policy suggestions aim to contribute to the formation of a successful gas hub in Turkey.

4.1. Short-Term Policy Suggestions

Since Turkey's Russia (some part of contracts) and Azerbaijan natural gas and Nigeria LNG supply contracts will expire until the end of 2021 (Rzayeva, 2018), Turkey is at a crossroads. In this regard, Turkey's most urgent decision will be either to renew these contracts or not. In this decision process, demand forecast comes out as a crucial factor. Furthermore, Turkey's prospective gas production has to be considered when analyzing Turkey's gas supply-demand balance. None of the gas supply contracts might be renewed in case Turkey's gas discoveries increase and Turkey's gas production satisfies domestic consumption. However, it is too early for now to make anticipation for future gas reserve discoveries. Hence, Turkey needs to make a flexible plan which can work in different scenarios. The question of "what percentage of gas consumption should be satisfied using long-term contracted gas" needs to be addressed here. This question is argued even in Europe's most liquid gas hub TTF since although Groningen gas field production is expected to halt in the following years, Netherlands doesn't have long-term supply contracts and will have to satisfy domestic consumption on a spot basis. Italy and Germany are the countries having long-term gas supply contracts for the great majority of their domestic gas consumption. Italy and Germany have managed their take-or-pay risk by removing the destination clause from the long-term contracts and reducing take-or-pay obligations (Blaket et al., 2018). Thus, these countries can open a window for spot trading in their natural gas market. On the other hand, the United Kingdom's gas supply comes from production, long-term contracted import and spot import. Since the UK has domestic production, supply-security concerns are much lower than the other European countries. In our opinion, considering European gas hub examples, Turkey should not ignore contract renewal options but needs to reduce the amount of long-term contracted gas to open a window for spot trading. Moreover, if Turkey renews these contracts, the destination clause should be removed and the take-or-pay obligation should be decreased as European countries have done in the past years. Furthermore, Turkey should change the structure of pricing formulas in the supply contracts if the contracts are

renewed. The first option should be adding the Turkish gas exchange price element into the formulas in the gas supply contracts. However, adding a liquid hub element such as TTF to pricing formulas might be an option in case suppliers do not accept Turkish gas exchange price as a benchmark.

If Turkey decides to renew gas supply contracts, the question of "who will renew these contracts" will need to be discussed. Although 2001 NGML clearly states that BOTAS cannot make new supply contracts until BOTAS' market share decrease under 20 percent. This clause of law should be readdressed before the expiration of gas supply contracts. European gas hub examples shed light on this subject as well. European countries such as the UK, Italy, Germany, and even the Netherlands still have national champion companies holding the majority of gas supply contracts. However, these national champion companies' structures have changed over the years using tools such as initial public offering and block sale of company shares. The funds provided by the sale of shares have been used by these companies to change their position from national champion to a global player. Turkey can follow a similar path by changing the structure of BOTAS and BOTAS's share in the market might not be diminished under a defined percentage of what is more than 50 percent. Although the above-mentioned suggestions need to be addressed in the mid and long-term as well, the process should be initiated in the short-term by changing BOTAS' structure.

Another critical step for Turkey in short term will be adding future gas products to gas exchange. Since future contract prices are used in European countries' hub-based long-term contracts as an index, it is inevitably crucial to have future products in the Turkish gas exchange. Following the entrance of future gas contracts, liquidity in the gas exchange should be enhanced using relevant tools.

4.2. Mid-Term Policy Suggestions

In the period between 2021 and 2026, the most important decision will be related to the renewal of the expiring Iran and Russia natural gas and Algeria LNG supply contracts. Moreover, if expiring natural gas contracts are renewed for a maximum of five years, then another decision related to the necessity to renew these contracts will need to be discussed again. At this stage, these contracts will need to be renewed in accordance with the supply security strategy. If production gas comes online in this period, then probably a volume of contracts corresponding to at least 10 bcm[10] will not be renewed. In the meantime, the renewed volume of contracts should be much more flexible than current gas supply contracts. Besides, any gas supply contracts signed after 2025 should have a Turkish gas exchange price element in the pricing formula.

Liberalization steps should be fastened after 2021 since take-or-pay obligations decrease if the gas supply contracts are not renewed with the same take-or-pay

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[10] Billion cubic meter

obligations as expiring gas supply contracts. Removing the destination clause from natural gas and LNG supply contracts will provide flexibility for Turkish gas importing companies to manage take-or-pay obligations and will give room for spot natural gas and LNG imports. To facilitate spot cross-border trade, a daily capacity auction mechanism should be adapted to all entry and exit points. Moreover, idle capacities in pipeline and LNG entry points should be determined considering take-or-pay obligations of long-term contract holders. Otherwise, long-term contract holders might not fulfill their take-or-pay obligations and suffer from this transition.

Finalizing interconnection agreements with Bulgaria and Greece might be an important step for Turkey to integrate the Turkish gas market into the European gas market and to facilitate cross-border trade. Export capacities in Greece and Bulgaria exit points should be improved in order to provide flexibility to gas importers to export gas when needed. Moreover, new pipeline projects might be developed to connect the Turkish gas grid to central European gas hubs especially in case Turkey's gas discoveries continue. Turkey should aim at increasing storage and LNG terminal capacities as well in the following years. Accomplishing these targets will be crucial steps for Turkey as well as gas discovery in the Black Sea

Structuring of BOTAS in short term can be followed by unbundling of wholesale, transmission, storage, and LNG terminal activities. All these entities should be powerful international companies. Furthermore, the wholesale and retail segment should be unbundled by facilitating competition at the retail level by regulations. Following the developments in the market, the end-user pricing structure should be changed from a regulated to a cost-based structure. The switching rate of captive consumers should be increased gradually with the increasing competition at the retail level. Further to those, social tariff support mechanisms that support vulnerable natural gas consumers should be implemented. In the meantime, a price cap should be set by EMRA[11] in order to prevent end-users from price-shocks in the global gas market.

In the midterm period, liquidity in the market should be increased with the new products in the gas exchange and integration of financial institutions into the system. High liquidity will grow reliance on the reference price created in the Turkish gas market. This will help importers to negotiate with suppliers to have pricing formulas comprising the Turkish gas price element. Moreover, enhancing OTC platforms and Price Reporting Agencies that report bilateral transaction prices will help to grow reliance on the Turkish gas market prices.

5. Conclusion

In this paper, we evaluated the Turkish gas market in terms of gas hub development by benchmarking the Turkish gas market with working gas hubs in

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[11] Energy Market Regulatory Authority (Turkey)

European gas markets. Firstly, we derived from the literature seven requirements to create a liquid gas hub. Then, we addressed these seven requirements by discussing the Turkish gas market's current situation. Considering the Turkish gas market's current situation, we made several policy suggestions for the Turkish gas market.

Turkey has a great opportunity to create a gas hub in the following years since most of Turkey's long-term contracts are expiring between 2021 and 2026. However, Turkey, as a first step, needs to make a decision whether to renew these contracts or not. We suggest Turkey open a window for spot trading by decreasing take-or-pay obligations and removing destination clauses from long-term gas supply contracts. Since Turkey has discovered gas reserves in the Black Sea, a flexible plan should be put on the table. Another important point for Turkey is changing state-owned company BOTAS's structure from a vertically integrated government monopoly to powerful international companies expertizing on specific activities. While liberalizing the market we believe that transition rules should be applied to prevent importers from not fulfilling their take-or-pay obligations.

To sum up, we suggest that Turkey needs to take the following steps in the mid-term period:

- Take-or-pay obligations should be reduced and the destination clause should be removed from long-term supply contracts.

- Renewal of the current supply contracts or signing new ones should be addressed together with the need for opening a window for spot trading.

- Interconnection agreements with Bulgaria and Greece should be finalized.

- Future products in the gas exchange should be developed.

- Storage, LNG, and pipeline infrastructure should be improved to a level that daily entry capacity will double daily peak demand.

- Interconnection capacities should be improved and a capacity auction mechanism should be implemented on the interconnection points.

- The end-user price structure should be changed from regulated to cost-based and a price-cap should be set.

- The structure of the state-owned company should be changed from a national monopoly to powerful international companies.

This study provides guidance to bureaucrats, politicians, legislators, policymakers, and any other entity who have the capacity to lead the gas sector and are responsible for designing the Turkish gas market structure and making decisions about the Turkish gas market's future. This study can be improved by adding scenarios for the commercialization of Black Sea gas and can form a basis for a study that investigates the opportunities for Turkey to create an LNG hub.

Moreover, an in-depth analysis of the technical functioning of EXIST and its role in the Turkish spot gas trading could be a good recommendation for future studies on the Turkish gas market.

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